Object-oriented programming

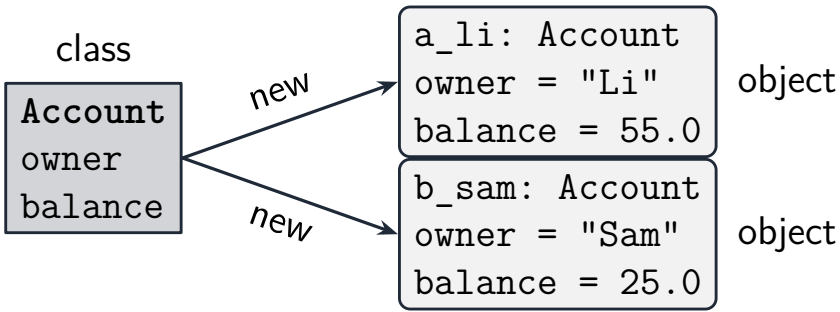
IB DP Computer Science B3 Object-oriented programming full package

Why model the world as objects?

> Write the design once; make one object per student.

- Theme B3 in Python, with Java where its syntax differs.
- Prerequisites: B2 variables, selection, loops and functions.

Class, object and instance



Same attributes, each with its own values.

Writing a class in Python

1. **Make** a_li = Account("Li", 40.0); b_sam = Account("Sam", 20.0)
2. **Call** a_li.deposit(15.0) changes a_li only
3. **Print** a_li.get_balance(), b_sam.get_balance() gives 55.0 20.0

Decision

Each object keeps its own balance.

Two names, one object

After c = a_li, a deposit through c is seen through a_li.

- A variable holds a **reference** to an object.
- Assigning copies the reference, not the object.

Instance and static members

Instance attribute

self.balance: one value per object.

Li and Sam each have their own.

Static (class) attribute

Account.count: one value for the whole class.

Each **constructor** adds 1: after two accounts it is 2.

Encapsulation

Access	**Java**	**Python**	**Who can use it**
private	private	_balance	own methods (Java enforces; Python by convention)
public	public	deposit	any code

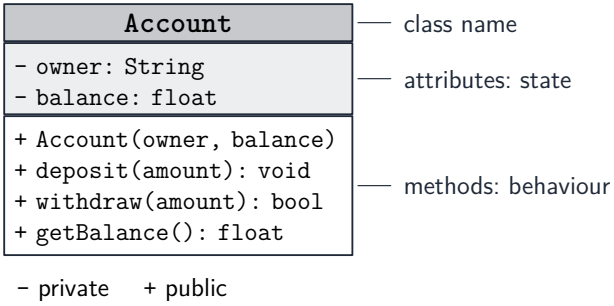
A mutator that checks

1. **Start** acc = Account("Li", 15.0)
2. **withdraw(30.0)** more than the balance: False, balance stays 15.0
3. **withdraw(15.0)** allowed: True, balance becomes 0.0

Decision

A rejected withdrawal leaves the **state** unchanged.

Why encapsulate?



> The class protects its own rules.

Designing a Book class

Attributes (private)	**Methods (public)**
title: String	lend(): bool
isbn: String	give_back(): void
on_loan: bool	is_on_loan(): bool

Advantages and limits of OOP

Advantages

Models real things; easy to discuss.

Classes are reused; encapsulation protects data.

Disadvantages

More code and planning for a small program.

More memory; a poor design is hard to change.

Practice

Your turn

Try these:

A. Class and object, using a phone model.
B. p = Account("Kai", 30.0); q = p; q.deposit(20.0): p's balance?
C. Why is balance private?
D. Attributes and methods of a cinema Screen.

Check yourself

